# SFC ENERGY RECOVERY WHEELS

## OPERATIONS AND MAINTENANCE INSTRUCTIONS

## LIST OF CONTENTS

# 1 INTRODUCTION

## 1.1 LEGAL DISCLAIMER

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Due to continuous product improvement, Swiss Rotors reserves the right to make changes to its content without prior notice. The introduction of changes will take place through the release of a new version of the document. The version information is visible in the footer of each page of this manual on the right (Ver. expressed by date of release in YYYY-MM-DD format, followed by language marking.

## 1.2 PREFACE

This OMI contains a number of important information regarding the design, storage, transport, installation and operation of Swiss Rotors products. The most critical information from the point of view of the above-mentioned aspects are written in the form of highlighted precautions (red symbol followed by text description).

## 1.3 GENERAL PRECAUTIONS

Read this manual in its entirety before installing, commissioning and operating Swiss Rotors products. Improper use of the product contrary to the recommendations of this OMI may cause damage not covered by the warranty. If in doubt, contact Swiss Rotors Technical Support.

For warranty claims, please prepare a full set of Swiss Rotors product identification information: Product type, size and serial number. This information is available on the product nameplates. Reports of defects covered by the warranty should be reported immediately after its occurrence. Damage resulting from transport should be directed to the carrier to whom the transport was entrusted. The Swiss Rotors product warranty does not cover damage resulting from improper installation, use or maintenance.

Failure to follow the guidelines of this OMI can result in significant property damage and, in extreme cases, serious personal injury, including death.

Under no circumstanced DO NOT connect any Swiss Rotors products to mains, before getting familiar with entire content of this OMI.

# 2 PRODUCT DESCRIPTION

## 2.1 RANGE

This OMI concerns the SFC range of 4 inches thick (100 mm) Energy Recovery Wheels (ERW) manufactured by Swiss Rotors. The general layout of the SFC ERW with parts descriptions is shown on Figure 1. The heat recovery wheel itself is supported by the housing made of galvanized steel profiles. The tightness between the wheel and housing as well as between both airstreams is secured by system of brushes to prevent the cross-contamination effect. Most of the components are maintenance-free, however some of them require regular inspection (refer to chapter 1 of this OMI).

To ensure long-term failure free operation of this product perform technical inspections at intervals not longer than those recommended in this OMI

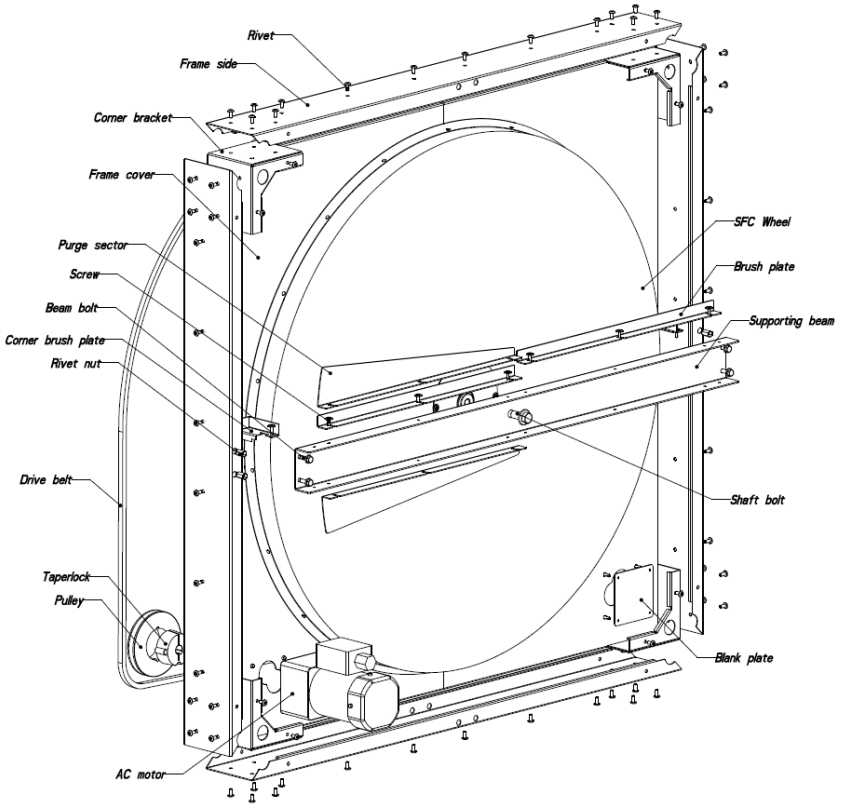


*Figure 1 – Design of SFC Heat Recovery Wheels*

## 2.1 SIZES

The range of SFC ERWs consist of 11 sizes, covering the mainstream of commonly applied wheels. Available sizes are given in Figure 1 and Table 1.

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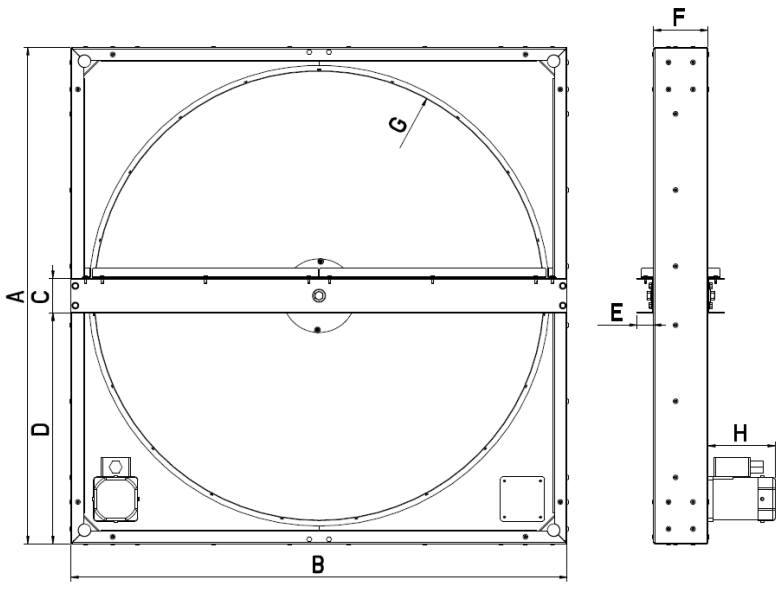



*Figure 2 - Dimensions of SFC ERW*

*Table 1 - Dimensions of the SFC Energy Recovery Wheels*

| Swiss Rotors SFC Energy Recovery Wheels | | | | | | | | | | | Net Weight (lbs) | Max CFM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model | Wheel Design | Dimensions [in] | | | | | | | | | | |
| | | Wheel Diameter | A | B | C | D | E | F | G | H | | |
| SFC-25 | Monolith | 25,00 | 29,00 | 29,00 | 2,04 | 13,44 | 1,36 | 4,36 | 25,00 | 5,40 | 79 | 1 500 |
| SFC-30 | Monolith | 30,00 | 34,00 | 34,00 | 2,04 | 15,98 | 1,36 | 4,36 | 30,00 | 5,40 | 99 | 2 100 |
| SFC-36 | Monolith | 36,00 | 39,80 | 39,80 | 2,82 | 18,47 | 1,36 | 4,36 | 36,00 | 5,40 | 124 | 3 100 |
| SFC-41 | Monolith | 41,00 | 44,00 | 44,00 | 4,27 | 19,85 | 1,61 | 4,36 | 41,00 | 6,00 | 165 | 4 000 |
| SFC-46 | Monolith | 46,00 | 50,00 | 50,00 | 4,27 | 22,86 | 1,61 | 4,36 | 46,00 | 6,00 | 198 | 5 000 |
| SFC-52 | Monolith | 52,00 | 56,00 | 56,00 | 4,27 | 25,96 | 1,61 | 4,36 | 52,00 | 6,00 | 236 | 6 400 |
| SFC-58 | Monolith | 58,00 | 62,40 | 62,40 | 5,00 | 28,71 | 2,11 | 6,06 | 58,00 | 5,10 | 307 | 8 000 |
| SFC-64 | Monolith | 64,00 | 68,00 | 68,00 | 5,00 | 31,50 | 2,11 | 6,06 | 64,00 | 6,80 | 358 | 9 700 |
| SFC-68 | Monolith | 68,00 | 72,00 | 72,00 | 6,00 | 33,00 | 2,11 | 7,09 | 68,00 | 6,30 | 423 | 11 000 |
| SFC-74 | Monolith | 74,00 | 78,00 | 78,00 | 6,00 | 36,00 | 2,11 | 7,09 | 74,00 | 6,30 | 481 | 13 000 |
| SFC-81 | Monolith | 81,00 | 85,00 | 85,00 | 6,00 | 39,50 | 2,22 | 7,09 | 81,00 | 6,30 | 580 | 15 600 |

## 2.2 TYPES OF HEAT ACCUMULATION MASS

All SFC ERWs listed are available with the heat accumulation mass as described in Table 2.

*Table 2 - SFC ERW. Type of available heat accumulation mass*

| Wheel Type | Wheel Code | Construction | Recovery Type |
|---|---|---|---|
| S-Sorption wheel | S | Monolith energy recovery wheel. Both layers of 3A molecular sieve coated aluminum. | Sensible heat transfer<br>Laten heat transfer based on condensation and sorption |

## 2.3 BASIC PERFORMANCE SPECIFICATION

### 2.3.1 SUPPORTED AIRFLOW RANGES

Supported airflow ranges of SFC ERWs are limited to values corresponding to maximum permitted face air velocities, which are

- Normal Constant Operation — 14,76 FPM (4,5 m/s]
- Startup Range — 14,73 → 16,40 FPM (4,5 → 5,0 m/s)

Sizes and airflow ranges of the SFC ERW range is given in Figure 3 Table 3 and Figure 4.

Each size of the SFC ERW wheel corresponds to the wheel diameter expressed in inches (Figure 3).


*Figure 3 - SFC ERW Diameter*

*Table 3 - SFC Energy Recovery Wheels - supported airflows*

| Model | Min airflow | Max Constant Airflow | Max Start-up airflow |
|---|---|---|---|
| SFC-25 | 280 CFM | 1 400 CFM | 1 556 CFM |
| SFC-30 | 400 CFM | 2 000 CFM | 2 222 CFM |
| SFC-36 | 600 CFM | 3 000 CFM | 3 333 CFM |
| SFC-41 | 780 CFM | 3 900 CFM | 4 333 CFM |
| SFC-46 | 1 000 CFM | 5 000 CFM | 5 556 CFM |
| SFC-52 | 1 280 CFM | 6 400 CFM | 7 111 CFM |
| SFC-58 | 1 600 CFM | 8 000 CFM | 8 889 CFM |
| SFC-64 | 1 920 CFM | 9 600 CFM | 10 667 CFM |
| SFC-68 | 2 180 CFM | 10 900 CFM | 12 111 CFM |
| SFC-74 | 2 580 CFM | 12 900 CFM | 14 333 CFM |
| SFC-81 | 3 100 CFM | 15 500 CFM | 17 222 CFM |

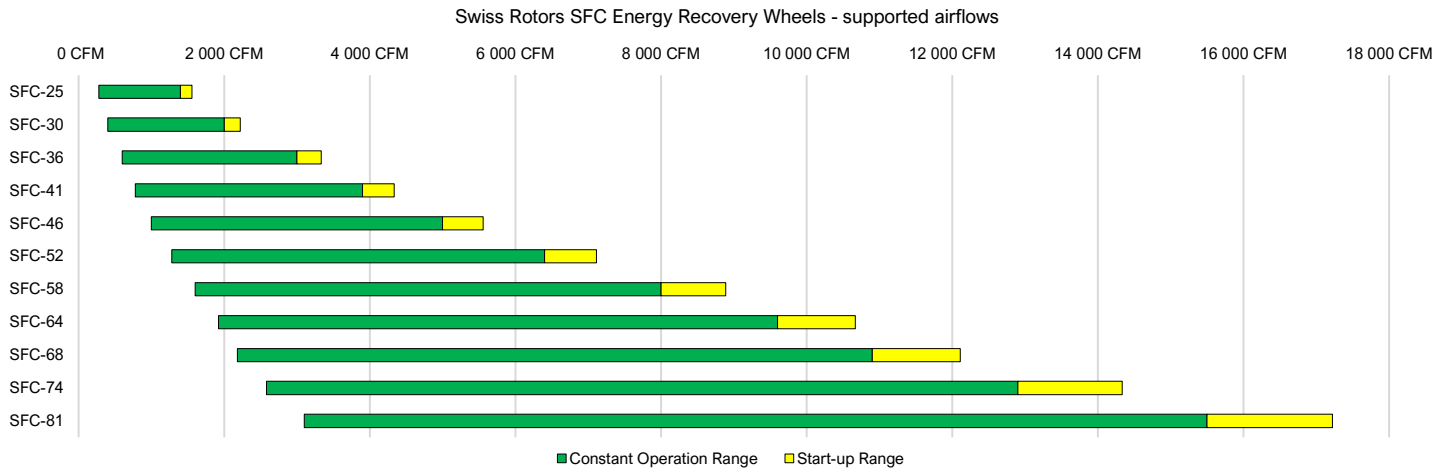



*Figure 4 - SFC ERW supported airflows*

SFC ERW recovery performance ratings are certified by the AHRI Air-to-Air Energy Recovery Ventilation Equipment Certification Program.

Basic performance specification of the SFC ERWs including sensible, latent and total heat recovery efficiency and the air pressure drop at given air face velocity is shown in Table 4 and Figure 5. This data is based on performance test results ran in the accredited testing labs.

*Table 4 - SFC ERH Basic Performance Information*

| Air face velocity [FPM] | Air face velocity [FPS] | Sensible Heat | Latent Heat | Total Heat | Air Pressure Drop |
|---|---|---|---|---|---|
| 200 FPM | 3,33 FPS | 74,00% | 89,00% | 79,00% | 0,27 inWG |
| 300 FPM | 5,00 FPS | 72,00% | 84,00% | 76,00% | 0,43 inWG |
| 400 FPM | 6,67 FPS | 71,00% | 79,00% | 74,00% | 0,58 inWG |
| 500 FPM | 8,33 FPS | 70,00% | 74,00% | 71,00% | 0,74 inWG |
| 600 FPM | 10,00 FPS | 69,00% | 69,00% | 69,00% | 0,89 inWG |
| 700 FPM | 11,67 FPS | 68,00% | 66,00% | 67,00% | 1,05 inWG |
| 800 FPM | 13,33 FPS | 67,00% | 64,00% | 66,00% | 1,20 inWG |
| 900 FPM | 15,00 FPS | 66,00% | 63,00% | 65,00% | 1,35 inWG |

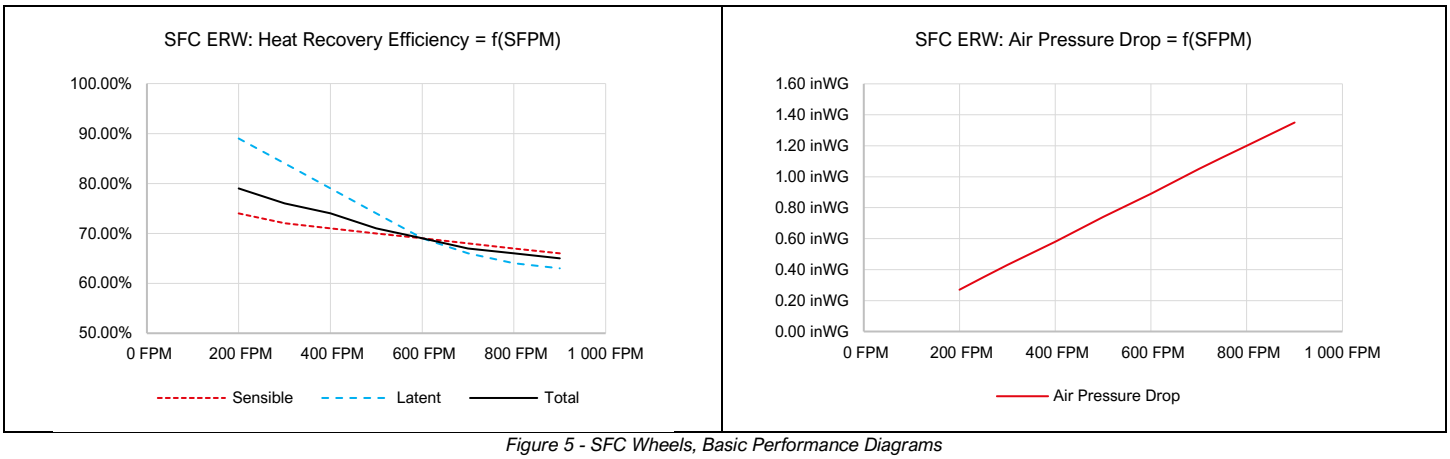
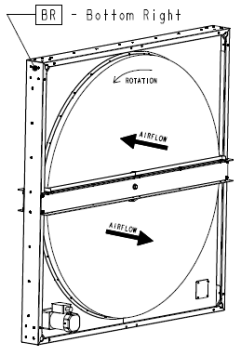
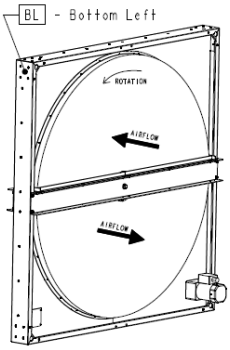
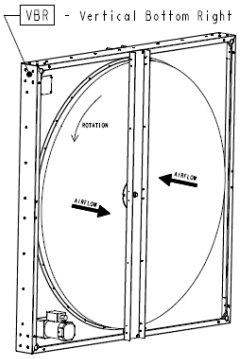
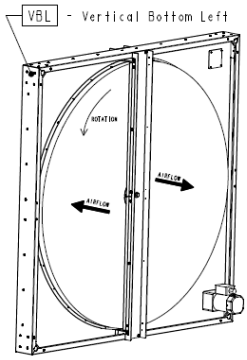
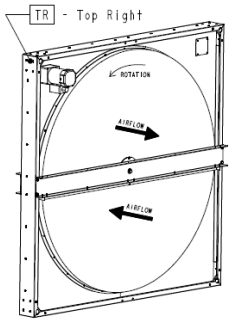
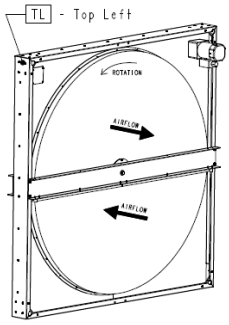
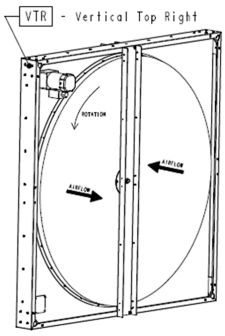
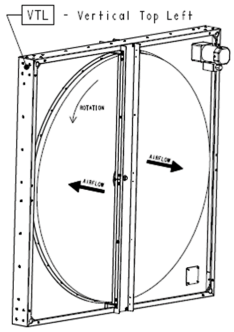



*Figure 5 - SFC Wheels, Basic Performance Diagrams*

## 2.4 DRIVE ASSEMBLY PLACEMENT

Depending on installation conditions, drive assembly can be placed in each corner of the Energy Recovery Wheel. The following configurations are available (Table 5).

*Table 5 - Airflow arrangement and drives placements*

| HBR – bottom right, Up-Down AHU decks configuration | HBL – bottom left, Up-Down AHU decks configuration | VBR – bottom right, Side by Side AHU decks configuration | VBL – bottom left, Side by Side AHU decks configuration |
|---|---|---|---|
|  |  |  |  |
| **HTR – bottom left, Up-Down AHU decks configuration** | **HTL – bottom right, Side by Side AHU decks configuration** | **VTR – bottom left, Side by Side AHU decks configuration** | **VTL – bottom left, Side by Side AHU decks configuration** |
|  |  |  |  |

⚠ While configuring the Energy Recovery Wheel, put special attention to place the motor on the supply air part, downstream the wheel itself, as shown on Figure 6.

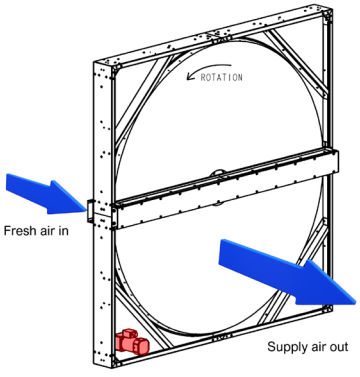



*Figure 6 - Motor assembly installed on AHU supply deck, downstream the Wheel itself*

The SFC wheel may be installed and run in vertical arrangements (V##) upto size SFC-52. Details about allowed arrangements of SFC ERW is given in Table 6.

*Table 6 - Allowed Horizontal (H##) and Vertivel (V##) arangements of SFC ERW*

| Model | HBR | HBL | VBR | VBL | HTR | HTL | VTR | VTL |
|---|---|---|---|---|---|---|---|---|
| SFC-25 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SFC-30 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SFC-36 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SFC-41 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SFC-46 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SFC-52 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SFC-58 | Yes | Yes | No | No | Yes | Yes | No | No |
| SFC-64 | Yes | Yes | No | No | Yes | Yes | No | No |
| SFC-68 | Yes | Yes | No | No | Yes | Yes | No | No |
| SFC-74 | Yes | Yes | No | No | Yes | Yes | No | No |
| SFC-81 | Yes | Yes | No | No | Yes | Yes | No | No |

## 2.5 SERIAL NUMBER IDENTIFICATION AND LABELLING

Each manufactured product is equipped with a rating plate with key information enabling its unambiguous identification. The nameplate is attached to the outer plane of the side profile of the housing (for horizontal positioning of the wheel support beams). Meaning or information listed on rating plates is described on Figure 7.

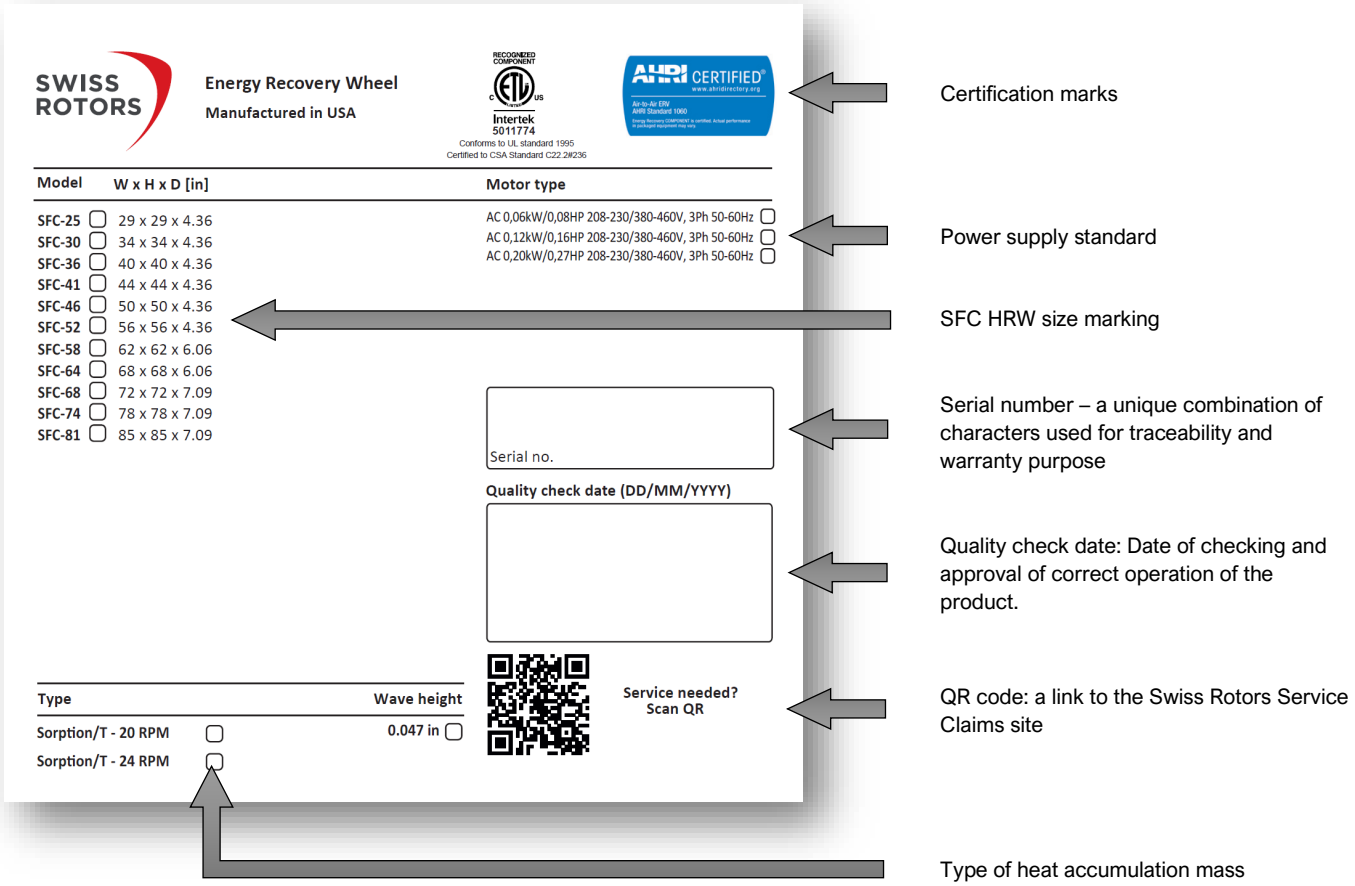



*Figure 7 - Rating Plate of SFC ERW*

# 3 TRANSPORTATION

Energy Recovery Wheels are products with a slim design and a high center of gravity, which makes them susceptible to tipping over. This should be remembered when planning any activities related to their transport (lifting, putting down, loading, unloading and installation). Before undertaking transport activities, secure the area where it will be carried out so that there are no people there, as well as objects that may be an obstacle to safe and collision-free transport.

## 3.1 PACKING

SFC ERWs are shipped on wooden pallets or shipping cradles, secured with straps to prevent tipping. The side surface of the wheel itself is additionally secured with cardboard and a protective film to prevent it from being scratched or dented.

Due to the specificity of the design, SFC wheels should be transported in a vertical position. Strong inclination of the SFC ERW during transport as well as exposing it to rapid acceleration may damage its key elements responsible for proper operation.

SFC ERWs are shipped on either wooden pallets or transportation supports, sealed against weather conditions, attached and strapped to prevent tilting. Wheel matrix is additionally protected with cardboard and stretch foil to protect from accidental scratches or punctures. SFC ERW are placed and tightly strapped to wooden pallets, per MOQ. Transportation supports can withstand the weight of the wheel and prevent tilting to facilitate safe transportation.

To avoid dents or scratches on the wheel surface please make sure to properly secure the package for the further transportation.

## 3.2 LIFTING

The SFC ERW should be lifted using the straps originally supplied, four for each wheel (Figure 9, Figure 10). Lifting the wheel should be done with the hooks attached to the straps in pairs. Avoid sudden jerks and bumps when lowering.

Originally supplied belts are selected in terms of their load capacity and should not be changed for. If the original belts are missing, contact your wheel supplier or Swiss Rotors. It is acceptable to reuse a belt from another SFC wheel. After completing the transport activities, remove the belts from the housing.

*Figure 9 - SFC ERW lifting*

## 3.3 HORIZONTAL TRANSPORTATION

Due to the significant mass of the SFC ERW (and the resulting inertia), sudden accelerations and decelerations should be avoided during horizontal transport. Failure to comply with these requirements may result in the wheel tipping over or collision with objects or persons in the vicinity of the transport area.

## 3.4 STORAGE

If the SFC ERW is not installed immediately after delivery, keep the product in its original packaging and follow the rules of proper storage. Prolonged exposure of the product to the improper conditions may damage and shorten the lifetime of rotary SFC ERW components.

- Avoid exposure to moisture, excessive sunlight and other weather conditions.
- Make sure the SFC ERW is positioned vertically on the dry and flat ground. Long-term storage on curved floor may cause tilting of the wheel and affect the factory pre--calibration. In extreme cases, warped wheel may scrub the interior of the casing and force the user to perform additional adjustments.
- Support and secure the SFC ERW against mechanical damages.
- Keep the storage temperature between 32°F and 89.6°F
- Do not stack SFC ERW on top of each other. Each piece should be stored separately.


*Figure 10 - SFC ERW horizontal transportation*

# 4 INSTALLATION

## 4.1 INSTALLATION PRECAUTIONS

This chapter describes key considerations for installing the SFC ERW. Failure to comply with the installation recommendations described in this chapter may result in improper operation of the product, its damage, loss of warranty and may also result in a threat to health and life.

Under no circumstanced DO NOT connect any the SFC ERW to mains, before getting familiar with entire content of this chapter.

The SFC ERW is intended to be installed inside the ventilation devices like Air Handling Units (AHU), Rooftop Units (RTU) and similar, in the way preventing its direct exposure to outdoor weather conditions.

When installing the SFC ERW ensure proper fitting between its body and the construction parts of the AHU/RTU to avoid uncontrolled air transfer between supply and return systems.

When designing the way the SFC ERW will be installed in the AHU/RTU mind to ensure easy access to its part which are subjected to periodic maintenance. Details concerning scope of typical maintenance works are listed in chapter 1 of this OMI.

## 4.2 MOTOR ELECTRICAL CONNECTION

### 4.2.1 GENERAL PRECAUTIONS

Electrical connections may only be made by authorized personnel with the qualifications required by local regulations. Failure to comply with this requirement may result in electric shock and, consequently, pose a threat to health and life.

When planning any installation or maintenance works on drive unit of SFC ERW, disconnect it from mains and wait minimum 3 minutes before attempting to work.

Drive units of the SFC ERWs are factory assembled and calibrated. Do not interfere in the assembly of the drive units without previous arrangement t with the manufacturer or Swiss Rotors service.

General guidelines for making electrical connections of drive units for SFC ERW are listed below. These guidelines are common to all available sizes within SFC ERW range:

- Use wires cross-section appropriate for the parameters of the power unit used. Information on the nominal current (FLA) can be found on the nameplate of the drive unit.
- Use copper hard wires or copper soft wires terminated with ferrules. Cables should be as short as possible.
- When arranging the cables, pay special attention to their careful positioning and fastening so that they cannot be caught by the mechanical elements of the SFK HRS drive unit (pulley, belt, etc.).
- When installing the SFC ERW in the AHU/RTU mind to secure proper ventilation to the drive motor. The air inlet grill of the motor must be clear of any objects which might limit its proper ventilation.
- Use overcurrent circuit breakers in the power line with a size appropriate for the nominal current (FLA) of the drive unit
- Apply multi-way switches in the power line of the SFC ERW drive.
- Perform grounding and other safety measures in accordance with local code.

### 4.2.2 DRIVE UNITS GENERAL SPECIFICATIONS

General specification of SFC ERW drive units is given in Table 7.

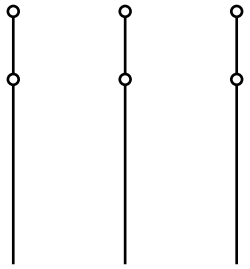
Drives listed in Table 7 are capable to run in On-Off mode as well as can be controlled by VFD (smooth revolutions adjustment).

*Table 7 - General specification of the SFC ERW drive units*

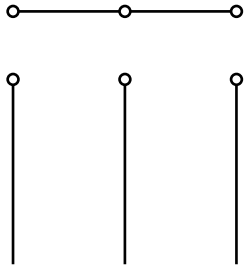
| Model* | Motor details | | Constant Speed Operation / VFD Operation | |
|---|---|---|---|---|
| | | | 3 x 208-230 VAC / Δ | 3 x 380-460 VAC / Y |
| | | | Connection Δ (Delta) | Connection Y (Star) |
| **SFC 25** | Motor model | | **5IK60GU-UFT - 5GU10KB** | **5IK60GU-UFT - 5GU10KB** |
| | Capacity | [HP] | 0,08 HP | 0,08 HP |
| | | | 2/25 HP | 2/25 HP |
| | | [W] | 60 W | 60 W |
| | FLA | [A] | 0,36 A | 0,21 A |
| **SFC 30** | Motor model | | **5IK60GU-UFT - 5GU10KB** | **5IK60GU-UFT - 5GU10KB** |
| | Capacity | [HP] | 0,08 HP | 0,08 HP |
| | | | 2/25 HP | 2/25 HP |
| | | [W] | 60 W | 60 W |
| | FLA | [A] | 0,36 A | 0,21 A |
| **SFC 36** | Motor model | | **5IK60GU-UFT - 5GU10KB** | **5IK60GU-UFT - 5GU10KB** |
| | Capacity | [HP] | 0,08 HP | 0,08 HP |
| | | | 2/25 HP | 2/25 HP |
| | | [W] | 60 W | 60 W |
| | FLA | [A] | 0,36 A | 0,21 A |
| **SFC 41** | Motor model | | **5IK120GU-UFT - 5GU5KB** | **5IK120GU-UFT - 5GU5KB** |
| | Capacity | [HP] | 0,16 HP | 0,16 HP |
| | | | 4/25 HP | 4/25 HP |
| | | [W] | 120 W | 120 W |
| | FLA | [A] | 0,75 A | 0,45 A |
| **SFC 46** | Motor model | | **5IK120GU-UFT - 5GU5KB** | **5IK120GU-UFT - 5GU5KB** |
| | Capacity | [HP] | 0,16 HP | 0,16 HP |
| | | | 4/25 HP | 4/25 HP |
| | | [W] | 120 W | 120 W |
| | FLA | [A] | 0,75 A | 0,45 A |
| **SFC 52** | Motor model | | **5IK120GU-UFT - 5GU5KB** | **5IK120GU-UFT - 5GU5KB** |
| | Capacity | [HP] | 0,16 HP | 0,16 HP |
| | | | 4/25 HP | 4/25 HP |
| | | [W] | 120 W | 120 W |
| | FLA | [A] | 0,75 A | 0,45 A |
| **SFC 58** | Motor model | | **5IK120GU-UFT - 5GU5KB** | **5IK120GU-UFT - 5GU5KB** |
| | Capacity | [HP] | 0,16 HP | 0,16 HP |
| | | | 4/25 HP | 4/25 HP |
| | | [W] | 120 W | 120 W |
| | FLA | [A] | 0,75 A | 0,45 A |
| **SFC 64** | Motor model | | **6IK200GU-UFT - 6GU6KB** | **6IK200GU-UFT - 6GU6KB** |
| | Capacity | [HP] | 0,17 HP | 0,17 HP |
| | | | 10/37 HP | 10/37 HP |
| | | [W] | 200 W | 200 W |
| | FLA | [A] | 1,15 A | 0,65 A |
| **SFC 68** | Motor model | | **6IK200GU-UFT - 6GU6KB** | **6IK200GU-UFT - 6GU6KB** |
| | Capacity | [HP] | 0,17 HP | 0,17 HP |
| | | | 10/37 HP | 10/37 HP |
| | | [W] | 200 W | 200 W |
| | FLA | [A] | 1,15 A | 0,65 A |
| **SFC 74** | Motor model | | **6IK200GU-UFT - 6GU6KB** | **6IK200GU-UFT - 6GU6KB** |
| | Capacity | [HP] | 0,17 HP | 0,17 HP |
| | | | 10/37 HP | 10/37 HP |
| | | [W] | 200 W | 200 W |
| | FLA | [A] | 1,15 A | 0,65 A |
| **SFC 81** | Motor model | | **6IK200GU-UFT - 6GU6KB** | **6IK200GU-UFT - 6GU6KB** |
| | Capacity | [HP] | 0,17 HP | 0,17 HP |
| | | | 10/37 HP | 10/37 HP |
| | | [W] | 200 W | 200 W |
| | FLA | [A] | 1,15 A | 0,65 A |

### 4.2.3 POWER SUPPLY SYSTEMS

Depending on motor ratings (as listed in Table 7), the motor will be connected to mains (or VFD) in one of circuits shown below



Delta (Δ) circuit



Star (Y) circuit

Default configuration of the junction box

**Delta (Δ) circuit**

*Figure 11 - Power Supply circuits for SFC ERWs*

After connecting the motor to the power supply, check the correct direction of rotation of the wheel. If the direction of rotation of the wheel is wrong, swap any two phases in the motor junction box. After swapping the phases, reverify correct rotation of the wheel again.

## 4.3 BRUSH RAILS INSTALLATION

The SFC ERW may be equipped with optional purge sector, which (if applied) will substituted of the of the brush rail as shown on Figure 12. If you plan to install the purge section on the SFC ERW go to chapter 4.4 of this OMI first. Once the purge sector is installed in intended position, install the brush rails and side brushes according to chapter 4.3.1 and 4.3.2. This sequence of actions will save your time end effort.

### 4.3.1 BRUSH RAILS

The SFC ERWs are equipped with a brush rails to prevent cross-contamination air between the supply and return airstreams. Brush rails are factory installed along all width of the wheel, on both sides of it (4 brush rails in total), as shown on Figure 12 and need no maintenance during installation or start-up of the SFC ERW.

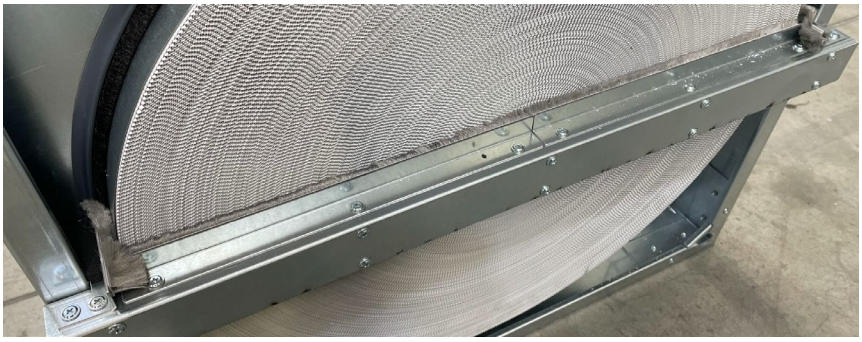


*Figure 12 - Brush rails on SFC ERW*

However, if the purge sector (refer to chapter 4.4 of this OMI) is planned for installation, some of the brush rails will have to be removed.

In case of disassembly and reassembly of the use cross screwdriver and follow steps shown on Figure 13. Mind, that brush rails must align the plane of the wheel but not impeding free spinning of it.

*Figure 13 – Main Brush Rail installation*

### 4.3.2 SIDE BRUSHES

Side brushes support the main brush rails in preventing the cross-contamination and are factory installed on each end of the supporting beams, both sides (4 side brushes in total). In case of disassembly and reassembly of the use cross screwdriver and follow steps shown on Figure 14.

*Figure 14 - Side Brushes Installation*

## 4.4 PURGE SECTOR

The purge sector is an optional part of the SFC ERW assembly, supporting a self-cleaning of the wheel as well as reducing the cross-contamination effect.

### 4.4.1 INSTALLATION OF THE PURGE SECTOR

Untighten screws holding the factory installed brush rail on the horizontal supporting beam and remove it (Figure 15). Install the purge sector to the same very place and tighten it using the same screws (Figure 16).

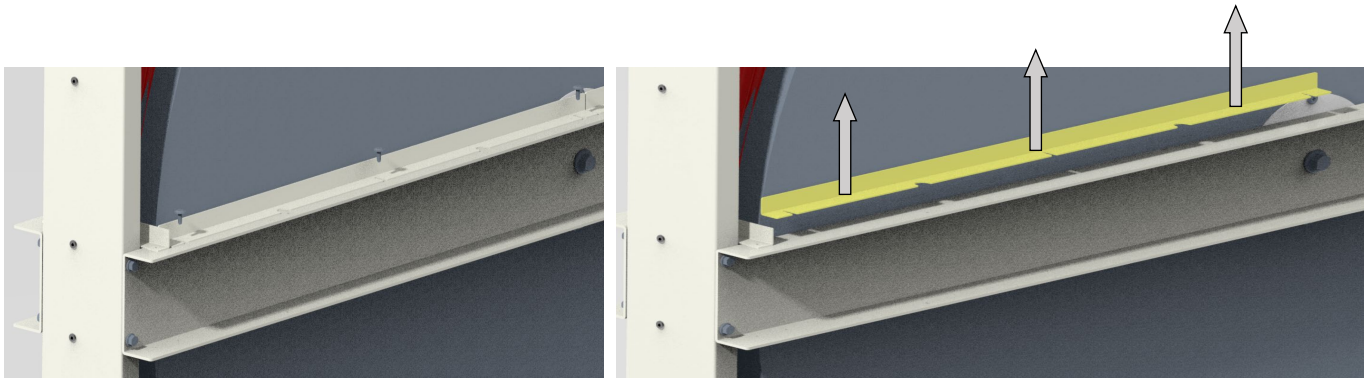


*Figure 15 - Disassembly of the factory installed brush rail*

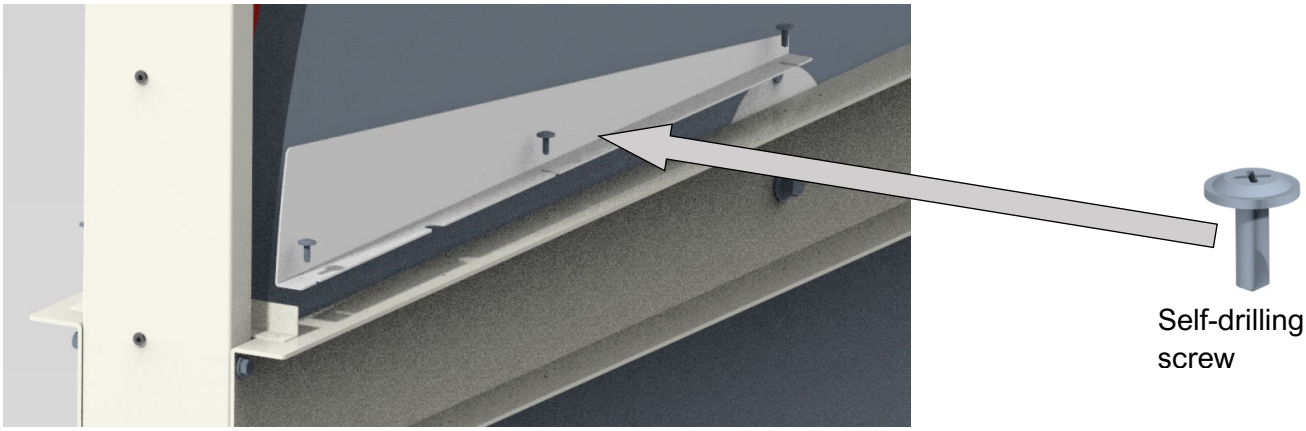



*Figure 16 - Installation of the purge sector*

The purge sector, brush rail and side brushes must be installed on the tame side of the supporting beam: Over (Figure 17) or under it (Figure 18), depending on the intended purge sector installation mode! Failure to do so will cause significant cross-contamination as well as limit the overall heat recovery performance.

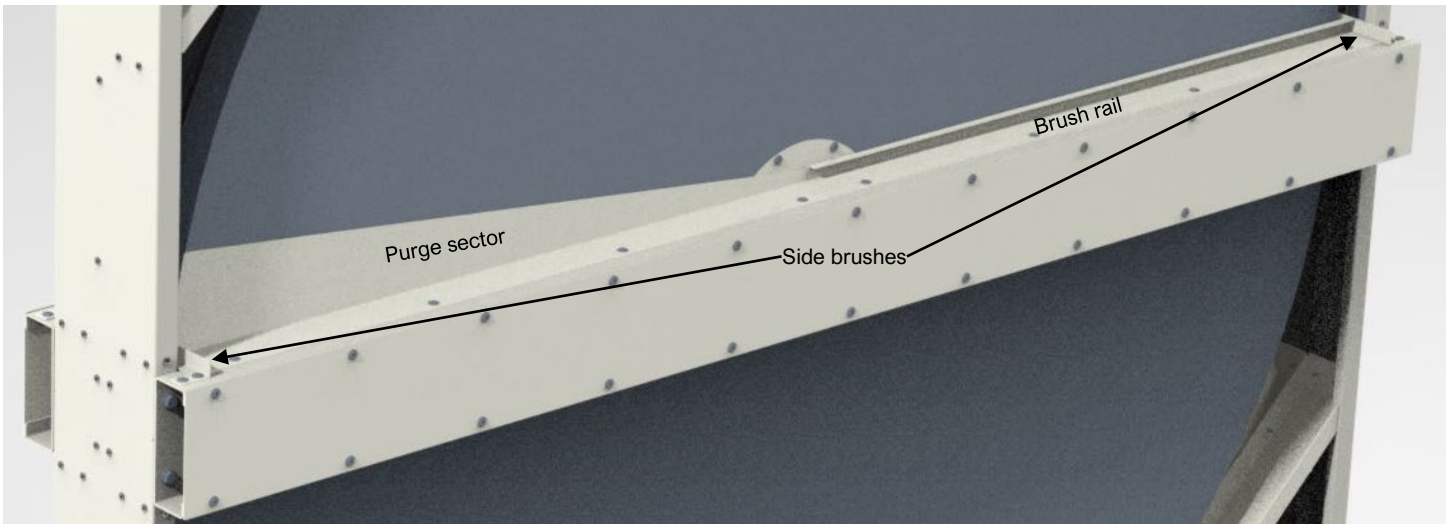



*Figure 17 - Purge sector, brush rail and side brushes installed over the wheel supporting beam*

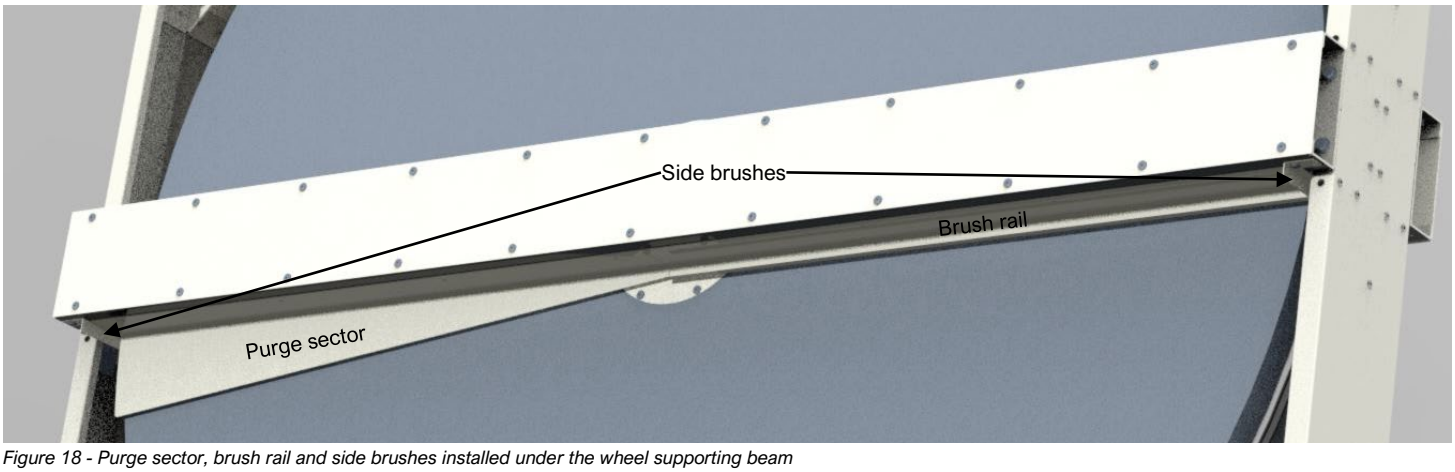



*Figure 18 - Purge sector, brush rail and side brushes installed under the wheel supporting beam*

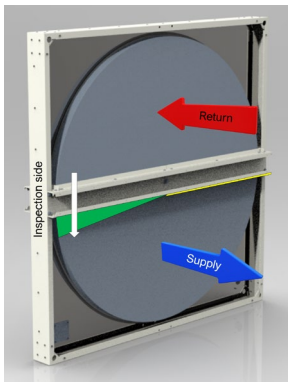
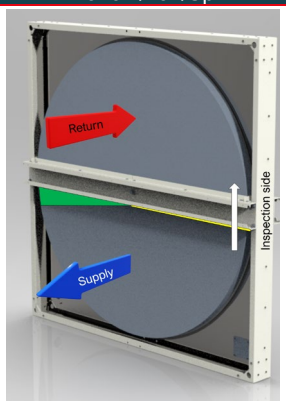
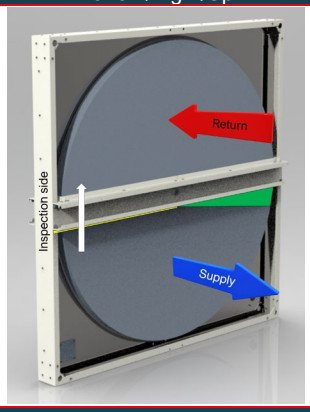
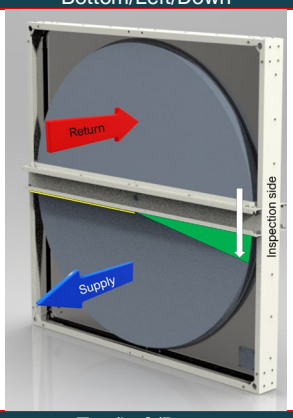
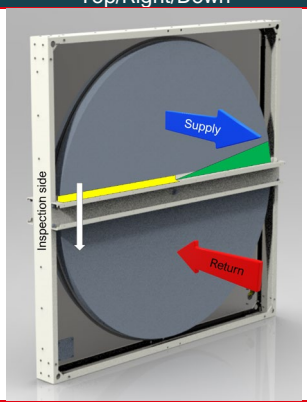
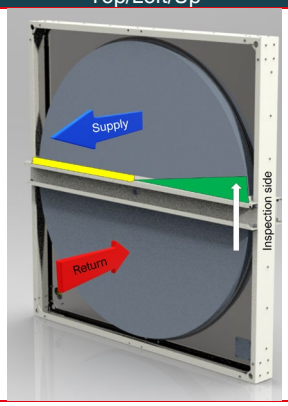
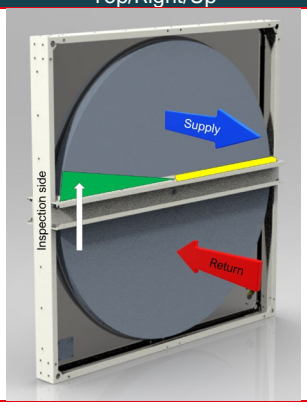
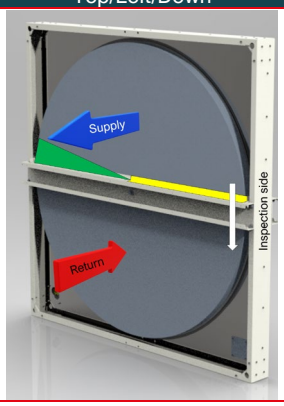
### 4.4.2 PLACEMENT OF THE PURGE SECTOR

The purge sector has to be placed in a right position depending on the SFC ERW configuration, like:

- AHU/RTU supply/return deck arrangement
- Direction of the wheel spin
- Inspection side of the AHU/RTU.

All possible options of mutual installation of the purge section and the brush rail is shown on Table 8. The markings of each configurations are: **Supply deck placement** / **AHU-RTU Inspection side** / **Wheel passage at the inspection side**.

*Table 8 - Variants of Purge Sector Installation*

| Bottom/Right/Down | Bottom/Left/Up | Bottom/Right/Up | Bottom/Left/Down |
|---|---|---|---|
|  |  |  |  |
| **Top/Right/Down** | **Top/Left/Up** | **Top/Right/Up** | **Top/Left/Down** |
|  |  |  |  |



Above listed purge sections configuration will apply to the side-by-side arrangement of the AHU decks, respectively.

# 5 START-UP

It is recommended to make a first run of the SFC ERW before installing it in the AHU/RTU. This will make it much easier to conduct a thorough inspection of the entire unit and spot any defects before installation. Refer to the Motor electrical connection chapter of this OMI.

## 5.1 BEFORE START-UP INSPECTION

Before the first start-up of SFC ERW, check the condition of the device from the point of view of completeness of mechanical elements and whether they show any signs of damage. Assuming proper transport conditions, SFC ERWs do not require additional adjustments before first start-up. However, if improper transport conditions are suspected, it is recommended to check and possibly adjust the key operating elements of the device, in accordance with the recommendations described in the chapter of this OMI. Listed below are the key items to be verified prior to first start-up:

- Crucial screw connections should remain factory sealed and marked with paint - make sure the seals are not violated or damaged. If you suspect damage to the product, please contact Swiss Rotors support.
- Check for any unwanted objects remain inside the housing which are not construction related. There should not be any obstacles that prevents smooth rotation of the wheel. Check whether it is possible to rotate the wheel freely by turning it manually. It should be possible to rotate the wheel with your bare hand.
- When turning the wheel pay attention to whether the it generates any unnecessary metal sounds or rubs against the casing parts. The only acceptable noises should be generated only by brushes and sealing sliding on housing and wheel itself.
- Verify the appropriate tension of the drive belt (belt must not slide). Check the visual condition on its entire length. Adjust if necessary (refer to chapter 1 of this OMI).

## 5.2 START-UP CHECKLIST

Before first start-up, complete all points of the checklist (Table 9).

*Table 9 - Start-up checklist*

| Checklist | Check |
|---|---|
| SFC ERW delivered in perfect conditions, no missing parts, screws and bolts properly tightened and sealed (where applicable) | |
| SFC ERW outer dimensions fit the interior of the AHU/RTU where planned for installation | |
| AHU is ready and tailored for the installation of SFC ERW. | |
| There are no unwanted objects or obstacles inside the casing of the SFC ERW. | |
| Wheel spins freely inside the casing and is not scratched or damaged at any place. | |
| Drive belt is placed and tightened properly on the pulley and wheel. | |
| Parameters of electrical power supply meet the SFC ERW rated voltage and FLA. | |
| Electrical connections to the motor are done properly with special regards to Δ/Y mode. | |
| Purge sector is installed in right place and is properly fixed to the wheel supporting beam | |
| Tools used for SFC ERW transportation (stripes or other) are removed | |
| Air ducts supplying the SFC ERW with air (OA, RA) are free of objects and dust | |

Once above check-list is completed, make the first run of the SFC ERW. Carefully observe all moving parts for first 15 minutes with special attention on stable operation of the drive unit (motor and gear), free of fluctuations and without significant heat release.

# 6 MAINTENANCE

## 6.1 MAINTENANCE PRECAUTIONS

Disconnect the SFC ERW from mains for maintenance works other than these which require the wheel to spin.

DO NOT touch any moving parts – risk of being caught in rotating parts (wheel, drive unit, belt). Use protective gloves to prevent injuries.

## 6.2 PERIODICAL CHECK

Perform periodical check of key parts of the SFC ERW, according to Table 10 and in time intervals no longer than given in Table 11.

*Table 10 - Periodical Inspection Checklist*

| Checklist | Check |
|---|---|
| Wheel spins smoothly without abnormal noise | |
| Surface of the wheel is free of mechanical damage. | |
| Surface of the wheel is free of contamination. The air channels in the wheel structure are not clogged. | |
| Side plane of the wheel is parallel the side plane of the housing plane and does not deviate in any direction. | |
| Drive belt is free of mechanical damages and shows no signs of wear. | |
| Belt adheres perfectly to the motor pulley - there is no skipping or loses. | |
| Belt is properly positioned on the entire circumference of the wheel - not twisted or flipped at any point. | |
| Tension of the belt is not too loose - no deviation from the axis of adhesion. | |
| Sealing brushes shows no signs of wear or damage | |
| There are no visible signs of loose connections on the entire SFC ERW. | |
| Housing is firmly attached to the AHU/RTU with not possibility to move in any direction | |
| Motor works smoothly - without skipping, overheating, pauses or generating unwanted noises. | |

*Table 11 – Inspection Checks Time Intervals*

| Part | First 12 hours | First 24 hours | First week | Every year | Every two years |
|---|---|---|---|---|---|
| Wheel matrix | X | X | | X | |
| Belt | X | X | X | X | |
| Pulley | | | | | X |
| Housing | | | | X | X |
| Brushes | X | X | | | |
| Purge Sector | | | | | X |
| Motor | According to the separate operation and maintenance manual of motor installed in SFC ERW | | | | |

## 6.3 ENERGY WHEEL MAINTENANCE AND CLEANING

The SFC ERW supporting the heat recovery process is constantly exposed to large amounts of passing air (Outside, Return) of varying purity. Therefore, regular maintenance of the wheel matrix is necessary. Time intervals between maintenance depend on air pollution degree, class and conditions of the filters applied to the AHU/RTU and other factors which may expose the wheel to contaminations. The guidelines of the ASHRAE Standard 62.1 may be helpful to determine best time intervals between the wheel maintenance (and cleaning).

The following methods of cleaning are recommended

- Vacuum cleaner for small amount of dust deposit which is easy to remove from the wheel side plane
- Stream of compressed air. Use an compressed air blow gun to remove the contamination from the wheel surface and internal structure.

Direct exposure of the wheel to the compressed air may cause damage to the fins on the heat transfer matrix. Keep the distance between the air blow gun and the plane of the wheel no less than 2 ft.

- Water spray with use of nozzle

While cleaning the wheel with water, keep the distance between the nozzle and the wheel plane no less than 2 ft. DO NOT USE DETERGENTS under any circumstances. Secure all electrical parts of the wheel assembly (drive and motor) from exposure to water.

Due to the technology used to coat the heat recovery matrix with the hygroscopic paint it may happen, that during first 24 hours of the wheel operation small amounts of the paint will be released from the wheel caused by repetitive contact with sealing brushes. This is a normal phenomenon of every new wheel observed at the start-up stage. Use a vacuum cleaner to remove the remains of the coating from the wheel plane, brush rails and side brushes.

## 6.4 DRIVE LINK BELT

SFC ERWs use a link belt to transmit the mechanical power from the drive assembly to the wheel. Due to its design, the link belt may expand during normal operating conditions, therefore periodical adjustment to its length may be required.

Make the first belt tension check after the first 24 hours of wheel operation. Check that the belt is in contact with the pulley on the drive side and the surface of the wheel itself. The link belt must not slip along the pulley and the wheel. Ensure, the link belt has no signs of wear or damage along its entire circumference.

In case of insufficient tension of the link belt (too loose), a correction to its length needs to be applied by removing excess links Single link and fragment of the belt is shown on Figure 19.

Due to design of the belt (link structure), there is no need to replace all of it in case of single link damage. The repair to the belt can be done by replacing the link with new ones.

To remove the excess links or to replace damaged links with new ones, use pliers and follow instruction given on Figure 20 and Figure 21.

*Figure 19 - Segments of belt*

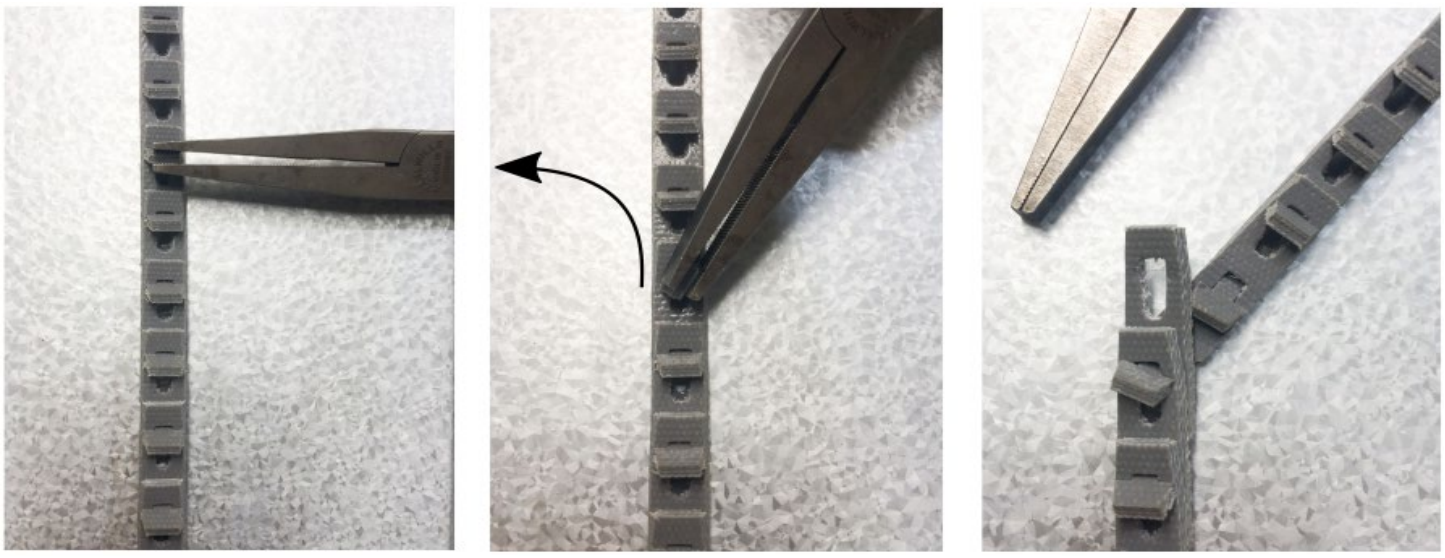


*Figure 20 - Drive belt segments replacing*

Unclip the belt using pliers. Grab the protruding tongue of the segment to remove and twist it to release the segment from the chain. Disconnect the belt in that place.

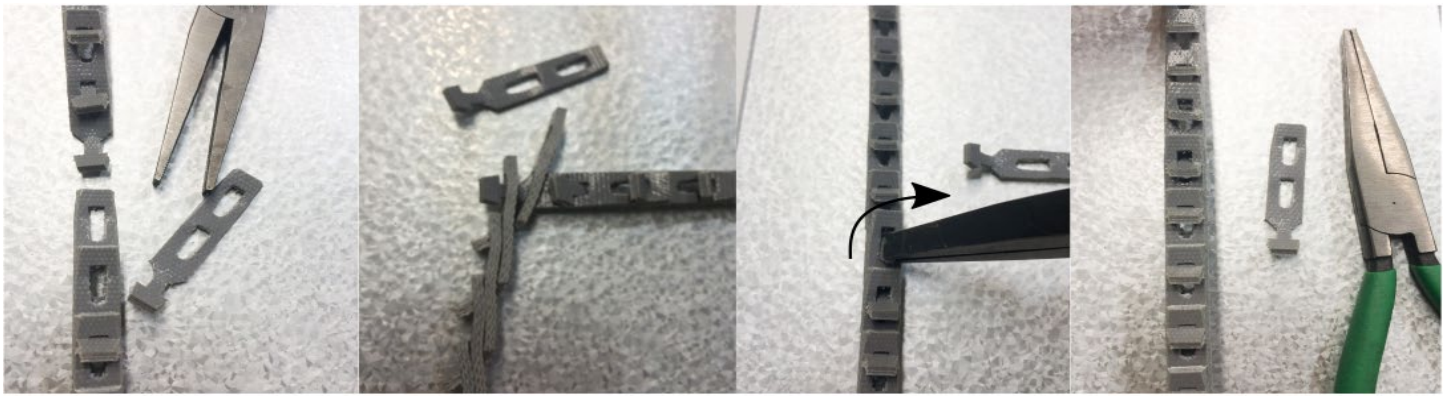


*Figure 21 - Drive belt segments replacing (continuation)*

Remove the desired amount of segments to increase the belt tension. Connect the shortened belt ends with each other by inserting the protruding tongue through the hole of the other half of the belt. Grab the second tongue and similarly insert it through the second hole – this time use the pliers to drag the segment tongue easier and twist it back to the starting position. Your belt is now shortened and the tension of the belt is increased.

If for some reason there is a need to completely replace the segmented belt, start with measuring the proper length of the new belt. Due to its extensibility, measure the exact length of energy recovery wheel circumference. Put the belt inside the casing and encircle the circumference of the energy wheel. Even if the length of the belt seems too short. stretch it and connect two of their ends near the pulley and transmission shaft using pliers. Having the belt clipped together – stretch the belt with force once again to put it on the pulley wheel.

The belt should be placed on the wheel and pulley on the side with the clips. To prevent the belt from falling during operation, a special guide inside which the belt is attached is used. Make sure that the belt is installed in the right manner. Correctly installed link belt is shown on Figure 22.

*Figure 22 - Belt arrangement on the wheel and pulley*

## 6.5 BRUSH RAIL

Brushes are located on both upper sides of the profiles. Inspect their condition and whether they adhere to the surface of the wheel matrix. Over time the brushes may lose their cleaning properties and it will be necessary to replace them or simply change their position on the profile. In order to adjust their position unscrew them with cross screwdriver and place properly.

## 6.6 PURGE SECTOR

Purge sectors are maintenance-free but their condition, rigidness and cleanliness must be checked every year. Pay attention to the distance of the sector against the recovery wheel matrix. Use compressed air to clean if required.

# 7 OPEARATIONS IN FROSTING CONDITIONS

SFC ERWs are designed to operate in an air temperature range of -40 °F to 140 °F

The Energy Recovery Wheels described in this OMI may, under certain conditions, be subject to the phenomenon of ice buildup on the surface of the cumulative mass itself. This phenomenon is a natural consequence of the thermodynamic processes occurring during the operation of the SFC ERW. It occurs, when the temperature of the outside air is lower than the freezing point of water (32 °F) and the return air has a relatively high moisture content.

## 7.1 CYCLIC ICING IN NORMAL OPERATING CONDITIONS

The appearance of cyclic icing on the surface of the cumulating mass is a normal phenomenon accompanying the heat recovery process in the winter. It occurs when any section of the wheel's cumulative mass (section of the wheel itself) is transferred from the fresh air stream (air with a temperature below the freezing point of water) to the return air stream (warm air, rich in moisture). As a result of the accumulation of cold on the surface of the wheel, icing is generated locally (moisture from the return air), which, as it continues to roll in the return air stream, is heated and de-iced. The heated section of the wheel goes back to the fresh air stream, where the heat accumulated in it is released to the supply air, at the same time being rapidly cooled down (the wheel) until it returns to the stream of return air, thus closing the entire regeneration cycle).

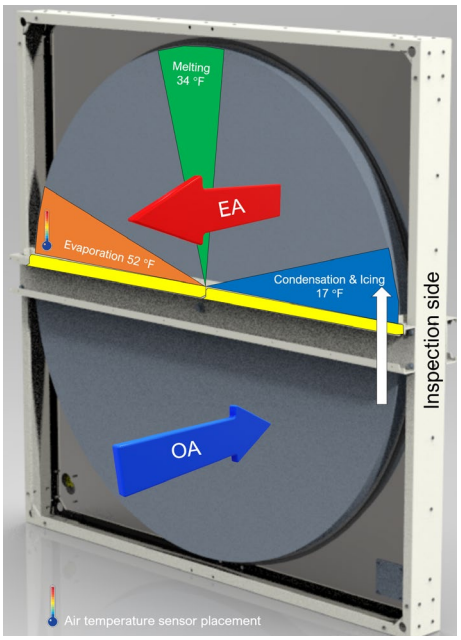



*Figure 23 – SFC ERW in normal operating conditions*

## 7.2 GROWING ICING IN ABNORMAL OPERATING CONDITIONS

As a result of unfavorable operating conditions of the SFC ERW, it may happen that ice will not be completely melted when passing through the return air stream. As a result, the section of the wheel still carrying remains of unmelt ice will be transferred to the fresh airstream, where it will be cooled down. This segment will be subject to further icing as it passes into the return airstream (gradual growth of the ice layer with each regeneration cycle). Typical conditions for the failure of self-defrosting capability of the are:

- Occurrence of extremely low outdoor air temperatures, below -4 °F, together with high moisture content in the return airstream.
- Strong misbalance between supply and return airflow, where supply airflow is significantly higher than return. In this situation the icing will result mainly from insufficient heat carried by limited amount of return air, even at temperature of outdoor air (fresh air) slightly below freezing point.

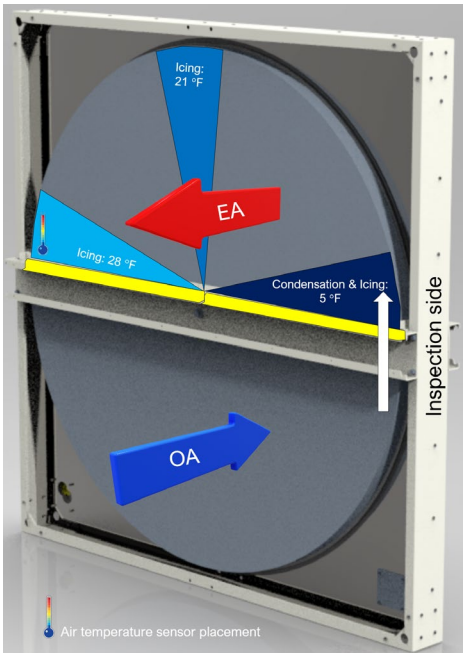



*Figure 24 - ERW in Ice Build-up condition*

## 7.3 ICE BUIILDING PREVENTION

In the following paragraphs, typical methods of ice build prevention or de-icing are listed.

### 7.3.1 ERW SPEED REDUCTION

Ice build prevention by SFC ERW speed reduction requires application of Variable Speed Drive (VFD) in the power line of the wheel drive.

Ice building prevention by gradual reduction of the wheel revolutions assumes, that the drive (motor) is supplied by VFD, which is capable to reduce the supplying current frequency, thus – to reduce the revolutions. Slowing down the wheel

revolutions causes, that time in which the wheel is exposed to the warm return air is expanded, giving the accumulated ice more time to melt.

Usually, a gradual reduction of the wheel rotation speed should take place when the temperature of the exhaust air (downstream the wheel) in the zone where the wheel rolls from the exhaust deck to the supply deck drops below +41 F (+5 C) Once, no more temperature drop tendency is detected, reduced revolutions of the wheel will get stabilized

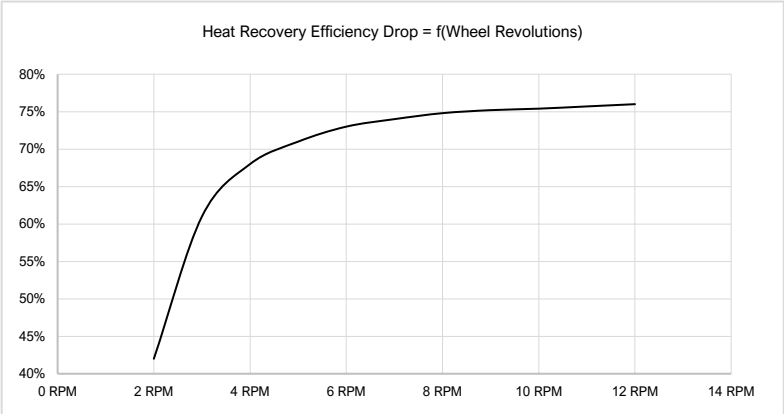



*Figure 25 - Heat recovery efficiency drop at limited revolutions*

Above described icing-control method enables to keep the wheel free of icing in a severely low temperatures of outdoor air and to keep the heat recovery performance still on relatively high level. This results from the fact, that HRWs show a slight decrease in efficiency at limited revolutions. Figure 25 shows relation between recovery efficiency and wheel revolutions, which between 10 and 6 RPM remains negligible.

In case the air temperature reading on the icing sensor increases above the threshold (+41 °F (+5 °C)), the revolutions of the wheel will increase to resume the normal operating conditions with maximum heat recovery efficiency.

Placing the temperature sensor in the exhaust airstream (downstream the wheel) just before the transition from return to supply deck of the AHU/RTU (see Figure 24 and Figure 23) is crucial for proper detection of conditions conductive for ice building.

### 7.3.2 FRESH AIR PREHEAT

Outside air pre-heater installed upstream the wheel in the enables to keep the fresh air heeding the SFC ERW at minimum temperature enabling its normal operations (as described in chapter 7.1 of this OMI). Application of the pre-heater (usually electric) is recommended for AHUs/RTUs running in climate zones where severely low temperatures of outdoor air occur for long time within a year. The role of the pre-heater will be to elevate the temperature of OA to level securing stable operation of the wheel at its maximum efficiency and free of ice-build.

Application of the outside air pre-heater can be combined with ice build prevention method based on SFC ERW speed reduction described in chapter 7.3.1 of this OMI.

### 7.3.3 OTHER ICE BUILDING PREVENTION OR DE-ICING METHODES

Besides above listed methods securing the wheel against ice building, other below methods may be used:

- Periodical stopping the wheel
- Partial bypass of the outside air (OA)

## 8 SUPPORT

If you need manufacturer support, please contact our regional office.

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